The Era of Innovation for Sustainability-Oriented Logistics: A Systematic Literature Review of European Studies

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Abstract Logistics has traditionally been seen as a poorly innovative sector and an ancillary business function aimed at reducing costs, and with severe impacts on the environment due to the emissions generated by the logistics processes. However, with new services, logistics is today becoming a strategic source of competitive advantage for organizations. In this evolution, it is unclear how innovation has driven the rise of logistics as a strategic function, and the role of innovation in the logistics sector—especially in the light of understanding the implications for sustainability. In this chapter, a Systematic Literature Review on the current state of the art of the debate around innovation management in the logistics sector is presented, with special emphasis on the scientific literature related to European countries. To shed light on this topic, we combine the Systematic Literature Review with bibliometric tools, and we identify approaches and areas where innovation in logistics has been introduced. Sustainability-oriented innovation emerges as a key topic, along with technology, transport-related innovations, and the customer's role within innovation processes.

Keywords Technological innovation · Sustainable practices · Logistics · Freight transport · Outsourcing

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1 Introduction

The logistics industry, among various sectors, accounts for a significant environmental impact and is responsible for a substantial rate of global pollution in terms of emissions of pollutants in air and water, noise, as well as resource consumption. The great concern surrounding the degraded state of the environment, driven by the tangible effects of climate change and social inequality, urgently calls for initiatives and innovative solutions across the world economy to address these environmental issues (Almeida et al., 2013).

Logistics creates a set of negative impacts on the environment and society (Kohn & Brodin, 2008; Mangiaracina et al., 2016), caused primarily by freight transport (Evangelista et al., 2017). Besides being under the spotlight for its environmental impacts, the logistics industry in Europe is also a matter of interest because it represents a key sector in the economy of the continent. In 2019, in fact, the European third-party logistics market generated revenues to the value of 177.6 billion US dollars, with a steady increase equal to + 12.5% from 2010 to 2019 (Statista, 2021). Tackling the environmental issues through innovative solutions able to overcome the externalities caused by the logistics industry would bring considerable benefits to the planet Earth, but still innovation in the logistic industry is largely neglected, despite a number of innovations in logistics technologies (for instance, RFID) and in the organization of logistics processes (for instance, cross-docking) and their roles in logistics operations (Busse & Wallenburg, 2011, 2014; Cui et al., 2010; Grawe, 2009). Innovation efforts in the industry seem to be addressed to reduce the resources needed to operate activities related to materials and information handling (cost-cutting nature of innovations, Grawe, 2009). As a consequence, the potential contribution of the logistics industry to the improvement of sustainability of its operations through innovative initiatives is still underexplored (Andersson & Forslund, 2018; Björklund & Forslund, 2018; Chu et al., 2018).

The relative novelty of the topic and the necessity to shed the light on the role of innovation in the logistics sector—especially in the light of understanding the implications for sustainability—provides the rationale for the study presented in this chapter, where a Systematic Literature Review on the current state of the art of the debate around innovation management in the logistics sector is presented, with special emphasis on the scientific literature related to European countries.

Findings show that the topic of innovation in the logistic sector obtained certain attention from the scientific community, and it is possible to identify several thematic clusters. One of the most relevant of those clusters is related to sustainability-oriented innovation, which is emerging as a prominent research area—and this is our first key result. Second, we identify the most relevant technological innovation foci in the logistics industry. Third, we find that research is still strong on economic and environmental innovation rather than on the social side dimension from a triple bottom line perspective (economic, social, and environmental sustainability).

This chapter is organized as follows: in Sect. 2, some basic concepts and definitions are provided, in Sect. 3, the research methodology is presented, Sect. 4 is devoted to the presentation of the results, and Sect. 5 is devoted to the discussion and conclusions.

2 Basic Concepts and Definitions

2.1 The Logistics Industry

The Council of Supply Chain Management Professionals (CSCMP) defines logistics as "the process of planning, implementing and controlling the efficient and effective flow and storage of raw materials, semi-finished and finished products and related information from the point of origin at the point of consumption with the aim of satisfying customer needs". The definition (CSCMP, 2013) highlights the key components of the logistics operations and allows for isolating the traditional objective of logistics as "getting the right product to the right customer at the right time and the lowest cost" (CILT UK, 2019). Consequently, logistics has traditionally been considered as a support function aimed at reducing costs to yield higher profits for the business, in other words, an ancillary activity within organizations (Mentzer & Williams, 2001). Therefore, the logistics sector has been for a long time oriented towards making the best possible use of resources to operate activities related to the delivery of products and management of information at the lowest possible cost.

However, over time, a set of driving forces have changed the role of logistics, making it become a source of sustainable competitive advantage (Mellat-Parast & Spillan, 2014). Among these, globalization, the evolution of technology, the push towards sustainability and decarbonization and above all, the practice of the outsourcing of logistics activities. This last element has driven the development of the logistics sector since an ever-increasing number of companies have been progressively looking to externalize logistics activities to achieve a higher level of customer satisfaction and survive in a strong competitive environment by focusing on their core business and devolving the management and execution of logistics processes to specialists, the so-called "third-party logistics service providers" or 3PL providers (Raut et al., 2018). All of these, combined with the evolution of the business-to-consumer processes driven by the changing requirements of consumers (who have progressively demanded faster, more customized, and more complex logistics services), have led the logistics sector to the necessity to identify new drivers besides the pure cost optimization to attain competitive advantage in the marketplace (Vlachos & Dyra, 2020).

Hence, logistics has shifted its role towards a more strategic function within organizations and a lever for building competitive advantage for companies. In this scenario, the evolution of logistics and the widening range of opportunities that logistics can create for organizations in terms of competitiveness lead to question the

traditional view according to which logistics is a "black box", a static cost-saving-oriented business function, in which 3PL providers are "box movers" rather than partners that can co-create solutions.

2.2 *Sustainability, Innovation Management, and Sustainability-Oriented Innovation*

Sustainability is a fundamental concept that embodies the responsible and balanced approach to meeting the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). Its relevance roots in the growing recognition within the scientific community, businesses, and society as a whole about the detrimental effects of human activities on the environment that lead to excessive resource consumption, leading to a progressive deterioration of environmental conditions and an increase in societal issues, such as social inequity.

At a corporate level, the concept of sustainability is based on the "three pillars" or "triple bottom line—TBL", namely: economic, social, and environmental areas. The first is the ability of the company to pursue the return on investment and profitability, the second is the ability to guarantee conditions of human well-being (safety, health, education, etc.), and the third is the ability to preserve the quality and reproducibility of the natural environment. Sustainable is a product, a process (or even the entire company) able to combine the achievement of targets in the three areas. Sustainability is becoming more important for all companies, across all industries. About 62% of executives consider a sustainability strategy necessary to be competitive today, and another 22% think that it will be in the future (Haanaes, 2016). If all companies aim to reach profit targets, the other two areas are less prioritized. On the one hand, at the environmental level, according to the scientific journal "Environmental Sustainability", we are on pace to produce 27 billion tonnes of solid waste by 2050 due to a business environment that maximizes rapid production and turnover of products to boost profits. Among the others, this is one of the causes for uncontrolled CO_2 emission. These are expected to contribute to a four-degree Celsius temperature rise by 2100 (two by 2050), which will result in sea-level rise and an increase in catastrophic weather events (Carrington, 2013). According to the Paris Climate Agreement, "businesses can have a major impact and account for 60% of emissions reductions by 2030" (Maryville University, 2019). On the other hand, at a social level, contemporary business is forced to move towards adopting social good practices; in this sense, key factors include equity and equality, poverty, health, education, delinquency, demographics, culture; and most of them can positively be impacted by businesses and their practices beyond the borders of the company. According to the UN Global Compact, social sustainability should be "a critical element in any business as it affects the relationships with stakeholders" (ADEC Innovations, 2020). Social sustainability can be considered as a way of managing and identifying

business impacts on employees, workers in the value chain, customers, and local communities.

In this landscape, businesses have been encouraged to achieve economic growth in a more sustainable way, orienting and pushing the development of innovation efforts to target higher levels of sustainability. Therefore, a central and challenging role is played by innovation, which "is here broadly defined to encompass a range of types, including new product or service, new process technology, new organization structure or administrative systems, or new plans or programme pertaining to organization members" (Damanpour, 1996). The management of innovation in business organizations (i) is a complex and multi-faced issue, largely debated in the last two decades and a number of books and manuals have been published (for instance, Schilling (2019) or Trott (2017) and many others), and (ii) it requires specialized competences, a proper corporate culture, and organization of resources. The typical areas of interest in the innovation management of a corporation are as follows (adapted from Schilling, 2019):

- **Intelligence phase**. It has the aim of collecting information and data from the company itself and from the external technological and competitive environment, in order to provide the most complete set to support the following decision-making phase. It includes the analysis of industry dynamics of innovation, potential sources of innovation, types and patterns of innovation, and standards and design dominance.
- **Strategic phase**. It is the aim of setting the strategic direction followed by the company and its implications on innovation management. Main decisions, along with the definition of the organization's strategic direction, are about the timing of entry and the formulation of a coherent innovation strategy.
- **Implementation phase**. It is the practical translation of the previous phase, and all tasks are needed to make innovation effective for business application and exploitation. Among the main tasks: choosing innovation projects, definition of collaboration strategies, open innovation, and technology adoption, protecting innovation, organizing for innovation, and managing the innovation process and team.

The aforementioned phases can lead to some minor improvements (incremental innovation), major improvements (radical innovation), or even to more systematic improvements on how the company is conducting the business (business model innovation). Several authors (for instance, Bessant et al., 2005) emphasize how these renewals are core in creating and sustaining value and competitive advantage, and when it comes to sustainability, the profitability and even the survival of the business are increasingly dependent on them. The same author stresses "Innovation represents the core renewal process in any organization. Unless it changes what it offers the world and the way in which it creates and delivers those offerings it risks its survival and growth prospects".

It is not surprising that, from the two previously mentioned streams, a new research area is born, namely sustainability-oriented innovation (SOI), which "involves making intentional changes to an organization's philosophy and values, as well as

to its products, processes or practices, to serve the specific purpose of creating and realizing social and environmental value in addition to economic returns" (Adams et al., 2016). So, the previously mentioned innovation management topics and tools are addressed to a precise scope. A misconception is to refer SOI to just green and environmental oriented innovation, and differently SOI is wider and can be related to the three dimensions stated before in order to pursue economic, social, and environmental objectives. One of the challenges that businesses have to face to implement SOI is the changing of the focus of activities and, from time to time, the business culture. The implementation of sustainability-oriented innovation involves all the functions and people inside the business, creating a SOI culture where the individual purpose and corporate purpose are connected, focusing on creating, with a long-term time horizon, a better society (Adams et al., 2016). This implies that businesses develop new processes and evolving business models to bring benefits to the three TBL dimensions on a large scale, not only relating to disruptive innovations and technologies but also to reduce the impact that existing solutions have (Plieth et al., 2012). The approach to introducing changes in the business culture should be followed by a proper engagement of employees in the corporate sustainability effort (Polman & Bhattacharya, 2016). So, speaking about culture, what can executives and managers do to bring sustainability-focused innovation to their organizations? There are five necessary elements (Geradts & Bocken, 2019).

- **Clear direction**: articulate the goals to employees. This involves explaining how sustainability-oriented innovation supports strategy and is incorporated into day-to-day operations;
- **Budget and resources**: provide an adequate budget and other resources (employees with the right economical resources for projects) to pursue the goals. Here, the goal is to help employees connect with the right experts;
- **Room for collaboration**: the importance of collaborative relationships with other parts of the organization of partners to address gaps in skills and resources. This collaboration could be done through behavioural incentives;
- **Positive reinforcement**: it is important to motivate employees who get involved in SOI projects;
- **The need for accountability**: organizations that want to promote SOI need to institute measures of accountability for the creation of value under a social and environmental logic. To encourage investment in sustainability-oriented innovation, 30% of the long-term incentive bonus of top managers is tied to the company's performance in an index developed by RobecoSAM, a Swiss investment firm that focuses on sustainability (Geradts & Bocken, 2019).

We can conclude by saying that sustainability-oriented innovation helps companies become more competitive and serves to identify new markets by responding to the needs of the whole world (Geradts & Bocken, 2019).

The implementation of SOIs can affect every aspect of the business, reaching all elements of the value chain from the organizational structure to the logistics. SOI implementation can be performed as a:

- **Process innovation**: focused on the production of goods and services with a particular focus on improving eco-efficiency (Huber, 2008) using managerial and different outputs to reach an effective efficiency of business operations (Altham, 2007);
- **Organizational innovation**: reorganization of businesses' structure implementing new management forms and focusing on engaging people within the organization to think and work for a more sustainable business (OECD and Eurostat, 2005);
- **Product innovation**: improvements or development of new technologies and services oriented to reduce the use of polluting materials, with longer durability and a more sustainable production process (Hart & Milstein, 2003).

To sum up, we can refer to SOIs with every action that has as objective the implementation of new elements that can have a better impact on the organization from a sustainability point of view. Additionally, when we refer to SOI, we can differ between incremental and radical innovations (Benner & Tushman, 2002).

3 Review Methodology

The adopted research methodology is the Systematic Literature Review (SLR), which can be defined as "a specific methodology that locates existing studies, selects, and evaluates contributions, analyses and synthesizes data" (Denyer & Tranfield, 2009, p. 671). This methodology is composed of the steps reported in Fig. 1.

The first step is "Question formulation", aimed at defining the study's scope to avoid ambiguity and formulating the research questions that drive the research and its development (Rousseau et al., 2008).

In the second step, "locating studies", keywords related to the investigated topic and the objective of this study were identified. The keywords are used to generate search strings that can be applied to search databases for retrieving papers. The papers were retrieved from the Scopus database, which is the largest database of peer-reviewed literature, including over 57 million records (https://www.elsevier.com/en-gb/solutions/scopus). We also explored retrieving papers from the database Web of Science. However, we found that the number of retrieved papers was smaller than what we found in Scopus, and these articles were already included in the sample from Scopus. Hence, we decided to rely entirely on a single database, i.e. Scopus. In the literature, there are other examples of the choice to rely on a single database (e.g. Kim et al., 2018).

In the third step, "Study selection and evaluation", several inclusion/exclusion criteria were defined to ensure the reliability and replicability of the search process and select relevant papers only. First, we decided to include peer-reviewed papers published in scientific journals and in conference proceedings to enhance the level of quality of the selected papers (Ali et al., 2017; Newbert, 2007). Additionally, papers were selected with restriction on publication year: only papers published

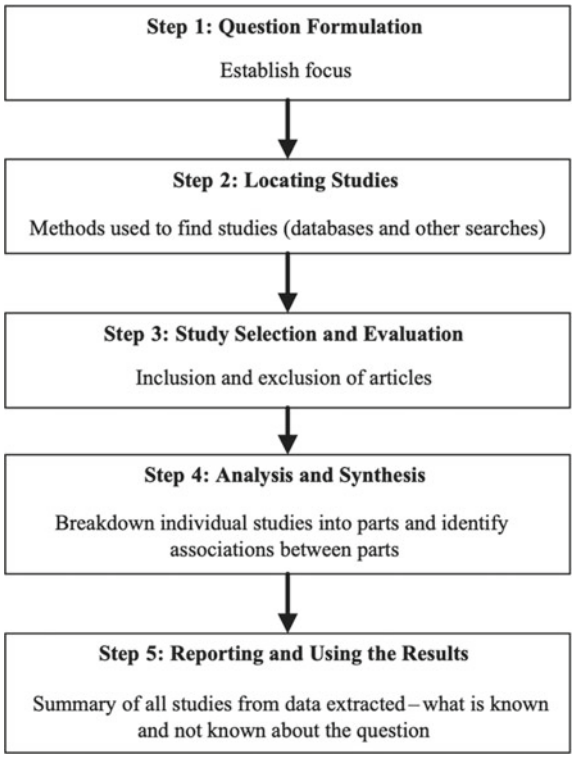

Fig. 1 Steps for conducting an SLR. *Source* Denyer and Tranfield (2009)

after 2011 were taken into consideration. The rationale for this choice is that the topic of innovation requires focusing on the most recent developments only and a 10-year review of the literature allows for a satisfactorily comprehensive analysis of the studied area. The selection of papers was then refined by excluding papers classified according to Scopus subject areas not aligned with the purpose of this study, e.g. medicine. Finally, only papers published in English were selected, since English is the dominant language in the field of logistics and innovation management research.

Within Step 4, "Analysis and synthesis", besides the content analysis of the retrieved papers, we performed a keyword co-occurrence network analysis to visualize and discover the research trajectories by examining the links among keywords (Radhakrishnan et al., 2017). With the adoption of elements of bibliometric analysis (see, for example, Colicchia et al., 2019), this choice represents an alternative approach compared to content-based literature reviews, which are usually based on two stages, the first one being a systematic review of the literature and the second one a narrative overview of the results (see, for example, Green et al., 2006; Salgado & Dekkers, 2018). We relied on the software package VOSviewer, a well-established tool to conduct such analysis (Van Eck & Waltman, 2017). VOSviewer uses the "Visualisation of Similarities (VOS)" clustering technique that provides a mapping

of keywords based on the Smart Local Moving (SLM) algorithm, as described in detail in Van Eck and Waltman (2013).

Finally, Step 5 "Reporting and Using the Results" synthesizes the evidence gathered from the analysis and allowed to derive insights for discussing the outcome of the review.

The study aims to answer the following overarching review question: *how does innovation take place in the logistics field and what are the areas where 3PLs/logistics companies have been more innovative?*

To retrieve papers, the following search string was defined by combining keywords through operators and Boolean logic and applied in the Scopus database:

(("logistics service" OR "logistics management" OR "freight transport*" OR "logistics industry" OR "logistics provider*" OR "third party logistic*" OR "logistics outsourcing") AND "innovation")*

The keywords were selected according to an iterative process, which included refining their definition through two focus groups conducted by the researchers with a panel of experts composed of academics working in the fields of logistics and innovation and of industry professionals from the logistics sector.

Since the focus of our research is innovation in the logistics field, the string was designed to find relevant papers for the overlap between the area of innovation management and logistics. The search was carried out in April 2021, resulting in 799 retrieved papers.

The undermentioned inclusion/exclusion criteria were used to select relevant papers. The initial pool of 799 papers has been later refined; in particular, we excluded 319 papers based on:

(i) The title and the abstract analysis.
(ii) The full-text analysis to ensure the relevance of the topic investigated by the papers.
(iii) Publication year (since 2011).

This led to obtaining 480 papers as a search outcome.

Among these papers, taking into consideration the countries of affiliation of authors, 129 contributions emerge from European authors. This allows to state that the topic has received certain level of attention among authors affiliated to European institutions (Fig. 2).

In the next sections, we present the results of the last two steps of the applied methodology in terms of co-occurrence analysis of keywords and the analysis of the resulting clusters of keywords. Since the main goal of this research is to investigate the aforementioned trends in Europe, only 81 papers (Appendix) have been selected, i.e. those focused on the "European" context (we selected those having "Europe" as a keyword assuming that the presence of such a keyword would ensure a specific focus on this geographical context).

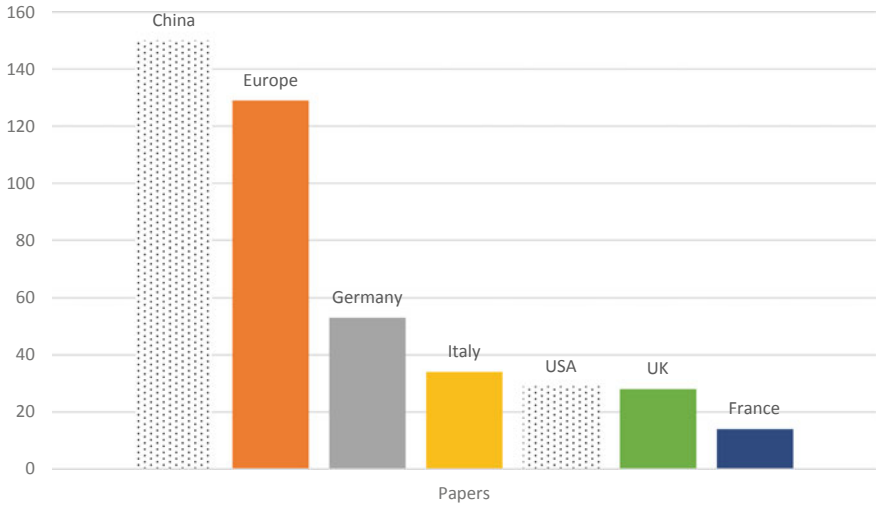

Fig. 2 Countries of affiliation of the authors of the contributions analyzed

4 Results

4.1 Co-occurrence Analysis of Keywords

The analysis of the co-occurrence network of keywords (authors' keywords and index keywords) is useful to identify the main research areas and patterns within the topic under study. The nodes of the network represent keywords and the links among them the number of times that keywords appear together in the same papers included in the analysis. The assumption is that the keywords can be used to position the papers with respect to research areas and other papers, by well representing the content of the papers themselves (Ding et al., 2001).

A total of 609 keywords were extracted from 81 papers (Appendix) of which 12 keywords occurred five or more times as represented in Fig. 1. The threshold value of five excludes the keywords with low frequencies and results in a more concentrated network. The keywords are grouped by the VOSviewer algorithm in five clusters (see Table 1). Clustering determines how related keywords are. The more articles in which two keywords appear together, the stronger the link between the two terms. The size of the circle representing each keyword in the figure reflects the number of times the keyword appears in the articles. Keywords with a higher rate of co-occurrence tend to be closer together as the distance between them indicates the relatedness of the keywords (Van Eck & Waltman, 2007). The overlay visualization of the network provides information on the temporal appearance of keywords to detect research trends and trajectories (Figs. 3 and 4).

Table 1 Keywords in each cluster

Cluster 1	City logistics, freight transportation, transportation, urban freight transport, and urban transportation
Cluster 2	Last mile, supply chain, and logistics
Cluster 3	Freight transport, Europe, innovation, and sustainability

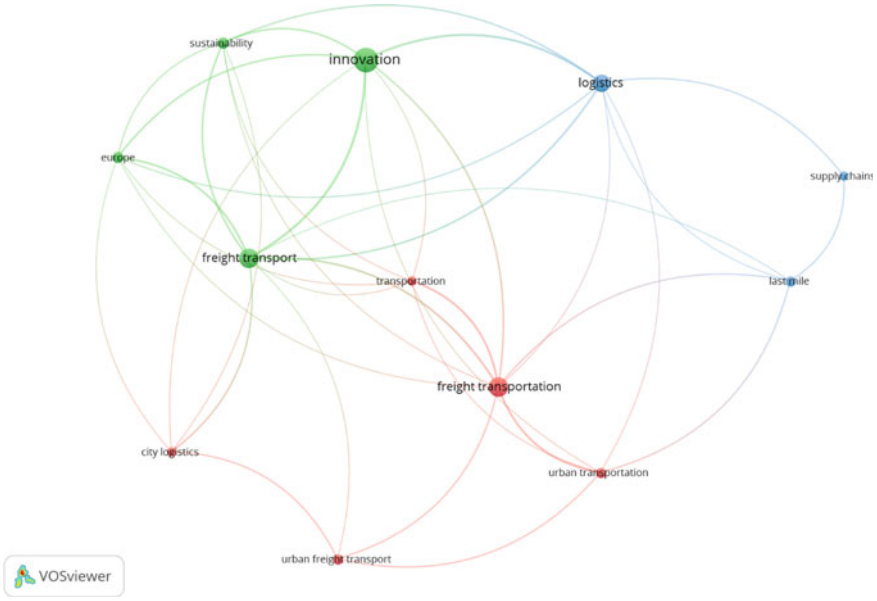

Fig. 3 Co-occurrence network of keywords

4.2 Results from the Cluster Analysis

In this section, we present the main insights from the analysis of the three clusters of keywords emerging from the bibliographic database. Each cluster reveals an area of research: the first two (clusters 1 and 2) show how contributions are always addressing the traditional key topics of the logistics industry, while the third (cluster 3) is surprisingly interesting, showing how the keyword "Europe" is combined with "innovation", "sustainability", and "logistics". Hereafter, some insights from the clusters are presented.

Cluster 1

The first cluster has—among the most recurring words—those relating to the theme of urban areas. These keywords are also discussed in relation to economic factors such as costs and new business models (e.g. crowdsourcing). The recent research in transportation is focused on solving the last-mile problem: the growth of e-commerce

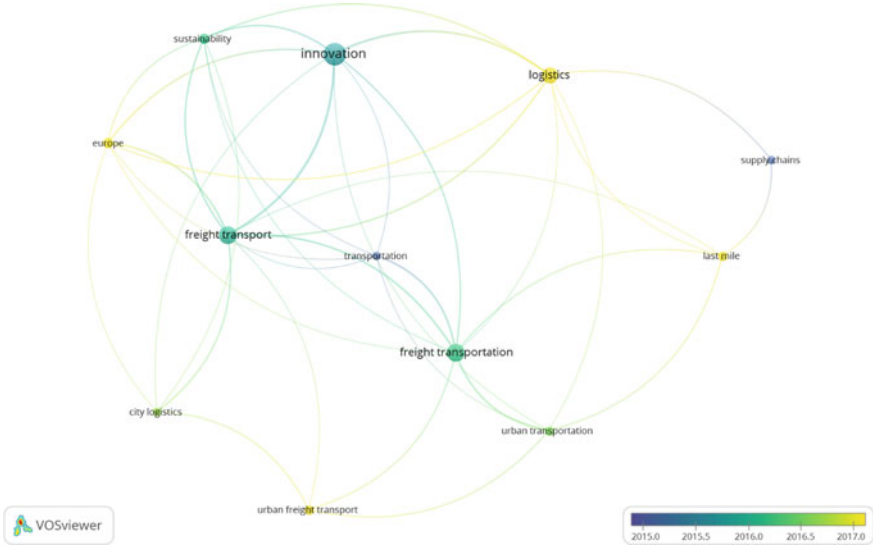

Fig. 4 Co-occurrence network of keywords (overlay visualization)

has increased on the one hand customer demands and transportation volumes and on the other hand the traffic and externalities in cities (Vakulenko et al., 2019). New technologies, such as autonomous vehicles, are now introduced to reduce the labour required to move goods, further reducing the cost of operations (Simpson et al., 2019). It is possible to say that despite the high potential of autonomous vehicles in last-mile delivery, logistics service providers must know how to introduce them in such a way the public finds acceptable. It is believed that autonomous vehicles are very risky means of transportation: in fact, autonomous vehicles involve potential risks such as that for safety when driving autonomously on public road networks (falling of a package on people) or the risk of performance during the delivery of parcels (for example, risk of technology malfunction) (Kapser & Abdelrahman, 2020), and this constitutes an interesting matter of debate.

Among the business models, the most novel and emerging theme in logistics is the so-called crowdsourcing, as shown by the very recently published papers dealing with this theme. Crowdsourcing belongs to the realm of the "sharing economy". The central idea is the optimization of under-used assets—both physical (e.g. cars, apartments) and intangible (e.g. skills, knowledge)—by sharing them through digital platforms (Buldeo Rai et al., 2021). The aim is to achieve economic benefits for all stakeholders and shareholders in a very innovative way commonly thought of as "Uber for logistics" (Buldeo Rai et al., 2021). Among the benefits recognized, crowd logistics can increase environmental sustainability (Buldeo Rai et al., 2021). This is one of the reasons why the growth of interest in the crowd logistics: crowd logistics is presented by scholars as one of the solutions to reduce the social and environmental negative impact of transportation in particular in the urban context.

However, crowd logistics is still an underdeveloped topic. Indeed, it has some critical issues not solved yet: first, the network, including crowds of customers and crowds of carriers is the crucial resource and must be maintained permanently; second, the return on investment can only be positive in the long run, making investments in crowd logistics which is currently very risky (Frehe et al., 2017).

Cluster 2

In the second cluster, the recurring themes and keywords are related to the introduction of new technologies and new trends in the broader logistics, supply chains, and again, last mile. In this cluster, scholars focus their attention on finding new solutions or new ways to exploit new technologies creating or add new services.

The research focus on the logistics and supply chain topics, look at technologies as a strategic lever to improve their competitive advantage. Evangelista (2013) explain how to add value to logistics services using ICT. Large companies have implemented ICT to manage information flows along the entire supply chain and have achieved positive results (Pokharel, 2005): the creation of end-to-end visibility, the reduction of cycle times and inventory, the minimization of the bullwhip effect, the decrease of CO_2 emissions, and the improvement of the overall effectiveness of distribution channels (Vanpoucke et al., 2009; Zailani et al., 2011). Technology is also used to improve LSP's performance: Barilla et al. (2020) find out that innovation in the logistics industry is a strong element in driving LSP's productivity.

In this cluster, a strong role is played by new delivery vehicles (e.g. electric or autonomous vehicles)—to improve the performances and, at the same time, to minimize some issues (see Monios & Bergqvist, 2020; Andaloro et al., 2015; Kapser & Abdelrahman, 2020; Mangano & Zenezini, 2019). Indeed, in this case, the new technologies adopted are aimed to reduce the negative impact on the environment (in terms of emissions) and society (in terms of work conditions).

In addition, several contributes to focus on the world of the Internet of Things (IoT) (e.g. Zhong et al., 2015; Hopkins & Hawking, 2018; Hsu & Yeh, 2017; Lin & Gao, 2014; Omarova et al., 2019; Rongfei & Yiyong, 2017; Xu et al., 2015; Yang et al., 2013; Yerpude & Singhal, 2020; Zhang et al., 2020). IoT is one the most important technologies developed within Industry 4.0 and it is also applied to the logistics field and included in the Logistics 4.0 paradigm (Barreto et al., 2017). IoT is usually associated with information technology, Internet, industrial engineering and is applied in the e-commerce sector. According to Hsu and Yeh (2017), the adoption of IoT by Logistics Service Providers (LSPs) should consider several critical factors related to three dimensions: technological dimension (i.e. technology benefits), organizational dimension (i.e. technical competence and capabilities), and environmental dimension (i.e. external pressure). The most critical factors in the introduction and utilization of IoT are related to IT expertise, top management support, government policy, competitive pressure, and security issues to be the most important influences. IoT makes the exchange of goods and services in global supply chain networks easier, creating at the same time concerns related to the security and privacy of the information of stakeholders. From this perspective, managers should orient their attention to

the improvement and promotion of these dimensions as they are the core among all the dimensions.

In addition to the adoption of IoT, other technologies and innovations are getting more and more attention by LSPs, such as using IoT as a tracing method for the real-data management of the supply chain to the installation of Automated Parcel Station (APS) as a collection point for customers (Hofmann & Osterwalder, 2017). The focus on the introduction of technologies in the LSP sector is guided through the aim to reach cost leadership and better customer service level. Logistics literature recognized that to reach a certain level of both, requirements of certain importance must be given to both expertise in terms of training and experience as managers and a certain level of knowledge and expertise in IT (Karia & Wong, 2013). The need for skilful, knowledgeable, and experienced people to implement organizational strategy, especially when it comes to cost reduction, is essential.

Cluster 3

The third cluster is the less expected. Although the text string used to perform the research about innovations in the logistic sector did not contain any keywords related to sustainability, the results include a considerable amount of information and articles about it. This shows the importance of this topic, highlighting how in recent years where more technological innovation efforts by companies is addressed to environmental and social factors. Moreover, it is also the cluster where the keyword Europe emerges, stressing how the sustainability-oriented innovation is pursued with great force in European countries more than in other parts of the world.

Taking a deeper look in the papers of the third cluster, the theme of sustainability-oriented innovation is addressed mainly to environmental issues and moderately to social issues. Indeed, it deals with environmental impact, sustainable development, product, or process innovations with the aim of being environmental compliance and sustainable. Sustainability is a topic that is becoming increasingly relevant within companies, leading to a change in the competitive landscape and the main driver for the development of innovation (Centobelli et al., 2020). LSPs, just like other businesses that compose supply chains, are shifting their focus to the sustainability topic, adopting new and different initiatives to reach a competitive advantage or at least a competitive parity (Hazen et al., 2011). Top management is changing the way to manage and execute activities, orienting to a rethinking of how to perform activities and practices in a more green and sustainable way. These activities are related to Green Supply Chain Management (GSCM). Related to the GSCM, it is essential to also introduce Green Reverse Logistics (GRL) topics. The concept of GRL is related to the management of products with different sustainable activities to reduce pollution creation. GRL activities identified by Hazen et al. (2011) are:

- Reusing;
- Remanufacturing;
- Recycling.

While suppliers and manufacturers are not the only contributors in facilitating green processes, LSPs are also required to redefine their processes by adopting green

logistics practices that have to affect the entire supply chain from upstream activities to the downstream ones (Gupta & Singh, 2020), introducing green innovations. LSPs can implement green logistics practices in their processes in both inbound and outbound activities (Sarkis, 2012) with a focus not only on environmental issues but with a focus on other dimensions such as economic and social.

From a managerial perspective, it emerges that a flexibility-oriented organizational structure helps LSPs when undertaking green innovation as a response to environmental concerns presented by customers. Referring to flexibility-oriented organizations, "it means that the organization is oriented to the emphasis of spontaneity and creativity" (Chu et al., 2018). Pressure from customers' environmental concerns works as a strong incentive for LSPs to adopt green innovations. Green innovations are a risky bet that can result in long-term competitive advantages from an environmental perspective (Centobelli et al., 2020).

Another important concept that must be mentioned regards sustainable urban freight transport (SUFT), which is connected to the outbound logistics activities for LSPs and influences all the previously indicated dimensions: social, economic, and environmental. One of the challenges that SUFT presents to LSPs is the necessity to identify innovative solutions that can adapt to the cities' development agendas on sustainable development systems and have the minimum impact on the total costs for logistics providers (He & Haasis, 2020). However, all these themes are indirectly related to the hottest topic in transportation literature: environmental sustainability. Reducing the factors that generate externalities ensures a better quality of human life and better management of resources sustainably. Ranieri et al. (2018) stated that "to reduce the costs of these transport externalities, it is possible to identify five main categories of innovations: innovative vehicles, stations or proximity points, collaborative urban logistics, optimization of transport management and routes, and innovations in public policies and infrastructures". Combining these innovations, a smart logistics city would be created (He & Haasis, 2020). City logistics projects are those of thinking from a sustainable perspective by minimizing negative impacts by ensuring an efficient movement of goods in urban areas. The increase of freight vehicles in cities contributes to congestion, air pollution, noise, and the increase in logistics costs and therefore in product prices. As regards the rationalization of the flow of goods, the Urban Logistics initiatives focus on consolidation in single delivery and collection points to avoid crowding (as parcel lockers).

As far as Europe concerns, different works are studying the characteristics of the transportation infrastructure from the sustainability and innovation perspectives. The several numbers of contributions by European countries, on one side, are promoted by the investments that European Union is making in the sector (Gkoumas & Christou, 2020) and on the other side comprehensible, given the superior pressure of the European citizen and sensitivity of the European companies on these topics.

5 Final Remarks

5.1 Discussion of Findings

The topic of innovation in the logistics field, addressed in this chapter, is novel (Björklund & Forslund, 2018) and relevant for the European countries, being either a key sector in the economy of the continent and one of the main sources of negative externalities for the environment and the society. For understanding the approach of the logistics companies to these issues, we investigated their innovation directions and, despite the cliché, old-fashioned, and traditional industry, the logistic sector shows a significant pace of technological innovation, and the in-depth literature review allows clustering the most relevant foci of innovation in three clusters:

(1) Urban logistics innovations.
(2) Logistics providers- and transport-related innovations.
(3) Sustainability-oriented innovations.

The analysis of each cluster has proposed several possible lines of further research, highlighting at the same time what innovations have already been investigated by available contributions (see Sect. 4). The analysis of the clusters allows discussing the following insights.

First, two of the clusters are basically expected to emerge since these are clearly driven by the innovations in industry-specific technologies and operators and as a direct consequence of the keywords adopted. Indeed, the cluster (1) and the cluster (2) show the innovations directly affecting the main actors and the main business processes characterizing the industry (logistics providers and transport companies) and how innovation is strategically leveraged. The analysis showed how the two clusters have been well developed by previous contributions and how these research streams are well populated.

Second, one of the three clusters, namely (2) is expected too since this confirms that two relevant technological innovations (IoT and ICT) have also impacted this industry even if received less attention by the scientific community. For what concerns these two clusters more studies are needed to assess the impact on the industry of some of the recent technologies (such as, for instance, Digital Twin and Blockchain) which diffusion appears as limited, the rate of adoption very low, and the application can have more potential than a concrete phenomenon. In this sense, additional contributions can shed light on the impact of several coming technological innovations on the logistics industry, with space for empirical experiments and tests as well for case studies.

For what concerns cluster (3), although the text string used to perform the research about innovations in the logistics sector did not contain any keywords related to sustainability, the results include a considerable amount of information and papers in this subject area (i.e. two clusters (1) and (2) cited the sustainability indirectly, while one cluster (3) directly touches the topic). These are the most recent ones as it emerges from the keywords overlay analysis (see Fig. 4). As stated before,

this shows the importance of this topic, especially in recent years, and how more often actions or innovations by companies are triggered by environmental constraints or opportunities. In cluster (3), there is a predominance of environmental issues while social issues have been mostly neglected. Even if the term "sustainable" has substantially replaced the term "environmental" or "green", the actual initiatives and the focus of the analysis of the reviewed contributions are largely related to the environmental side of sustainability only, without embracing all its dimensions. Due to the evident importance of this topic and due to the relevant impact of such industry on the ecosystem, that is another area with a great potential for further studies since companies will be soon required to be more effective and to minimize and offset their impact on the environment and the whole society. The presence of such gaps in the literature suggests matching the state of the art in the logistics industry with the stream of SOI (sustainability-oriented innovation), which seems to be the most promising current area of analysis for the logistics industry.

Furthermore, looking horizontally at the clusters, it appears evident that the typical innovation and technology management issues that emerge from the SLR are not broadly discussed and deeply studied as it happens in other industries (for instance, pharma, ICT, and automotive industries have been already deeply studied, and their specificities highlighted).

5.2 Concluding Remarks

In conclusion, the findings of this study highlight the importance and the types of innovative sustainable practices in the logistic sector addressing environmental challenges and fostering a more resilient and equitable future.

Moreover, this chapter sheds light on new and overlooked research directions that hold implications for scholars and researchers. These include:

- Exploring sustainability-oriented innovation in the logistics industry.
- Examining innovations and practical applications through case studies.
- Delving into technology and innovation management practices within logistics firms, such as the innovation process, open innovation, evaluation and selection of innovation projects, organization of research and development, and other related topics.

These avenues of research offer promising opportunities for further investigation and contribute to the advancement of knowledge in the field.

While a review of the grey literature can provide a more comprehensive understanding of real-world developments, it is important to note that the present research also offers valuable insights for managers and entrepreneurs. The findings of this study present practical implications and potential opportunities that can guide decision-making processes in the business world. By examining the results and recommendations of this research, managers and entrepreneurs can gain valuable

insights to inform their strategies, enhance operational efficiency, and adapt to the dynamic landscape of their respective industries:

- Risk-taker managers, start-uppers, and first movers can easily find pioneering technologies and free-market spaces.
- Managers underestimating the emerging role of innovation and technology management in a mature industry, such as logistics, can review the business priorities.
- Practitioners, in general, should be aware of the coming wide impact of sustainability in the logistics industry, exceeding the more usual discussion (limited to few environmental topics often associated with mere green marketing, greenwashing or concurrent cost minimization) and be inspired to go farther beyond.

Known limits are associated with the Systematic Literature Reviews—which can be a powerful tool for identifying and synthesizing existing research—because their usefulness: (i) can be limited by the keywords and search terms used in the review process, and (ii) it depends on how up-to-date the research is.

For what concern the former, if the search terms are too narrow, relevant studies may be missed, while overly broad search terms can result in an overwhelming number of studies to be screened. Additionally, different search terms can lead to different results, so the choice of keywords can impact the overall conclusions of the review. The potential impact of different search terms should be carefully considered when conducting a systematic review, and multiple searches using different combinations of keywords or databases may be necessary to ensure a comprehensive review of the literature. In our case, for instance, to avoid an excessive expansion of the search area, search terms as "supply chain management" and "supply networks" have been employed. While we did not use a formal keywords' cleaning process, as mentioned we built our search string through an iterative refinement process involving a panel of experts, which helps in limiting potential bias in the search. As for the use of multiple databases, as explained in the methodological section, even if we reported the results of the search on Scopus only, we actually also interrogated an alternative database (i.e. Web of Science)—which returned a smaller number of papers already included in the sample from Scopus. This helped in avoiding an incorrect representation of the field of study. Additionally, when the research on which the analysis is based is not recent, significant limitations in the reliability and validity of the results obtained may arise. This is because knowledge and technology advance rapidly and older research may no longer be relevant or generalizable to current contexts. Additionally, the results of an SLR based on non-recent research may not be representative of the most up-to-date knowledge in the field. Therefore, we consider the limitations that the use of non-recent research can have on the results of the analysis.

Further, updated, investigations can overcome the aforementioned limitations. For example, addressing the new search terms could enable researchers to generate additional findings, and new update analysis can include the most recent contributions. Additionally, future research could explore alternative approaches or methods that could better capture the complexity of the phenomenon under investigation. Overall, addressing the limitations identified in the current article could lead to a deeper

understanding of the research topic and inform the development of more effective managerial decisions and policies.

Appendix

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